
The Role of Ring Current on Slot Region Penetration

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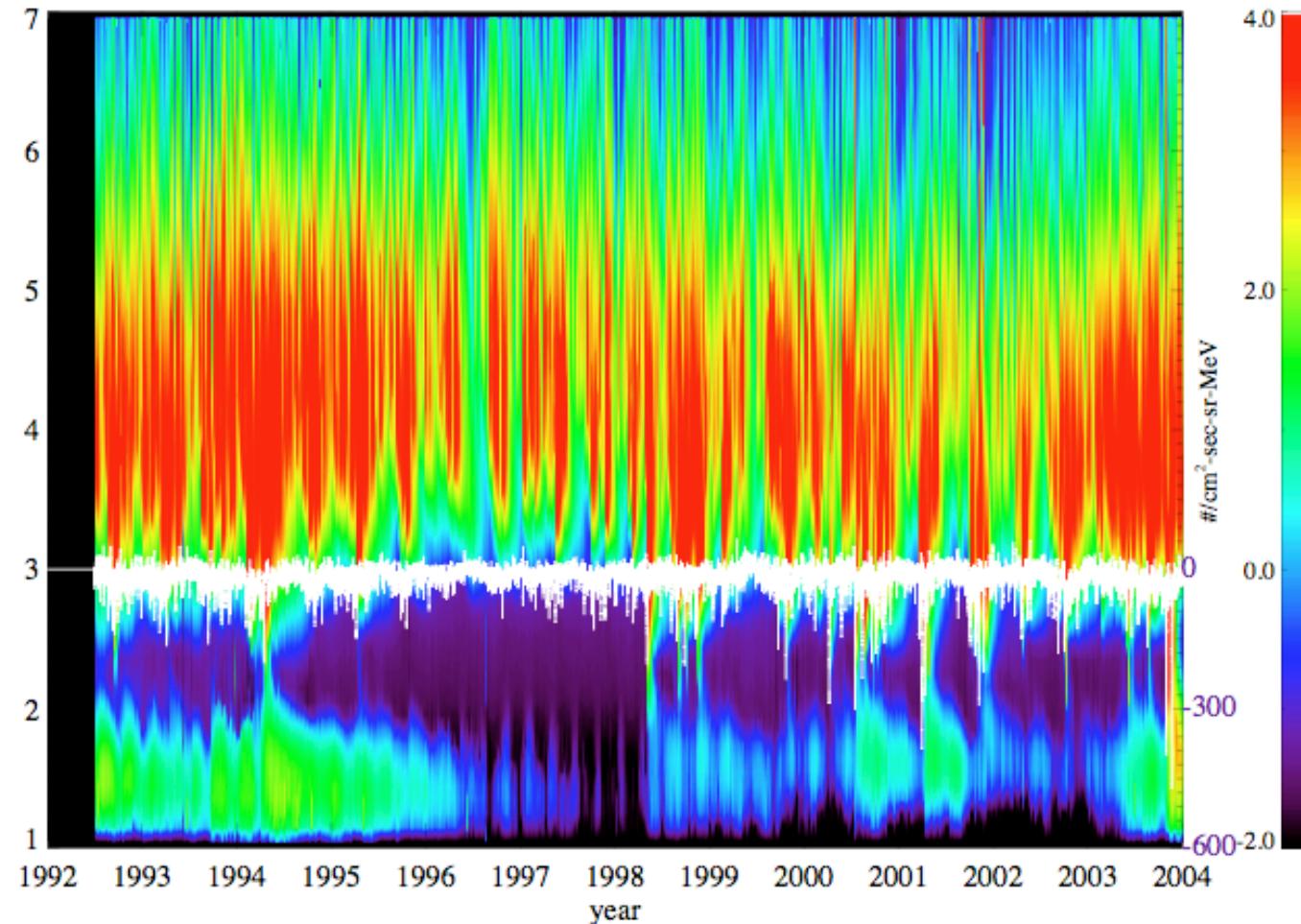
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Baltimore, MD

The Role of the Ring Current on Slot Region Penetration

- Filling of the slot region is observed during major storms.
- Great storm on 10-14 August 2000 is simulated.
 - The Radiation Belt Environment (RBE) Model
 - RBE simulations with T04 and T96
 - Spectral analysis of B(T04) and B(T96)

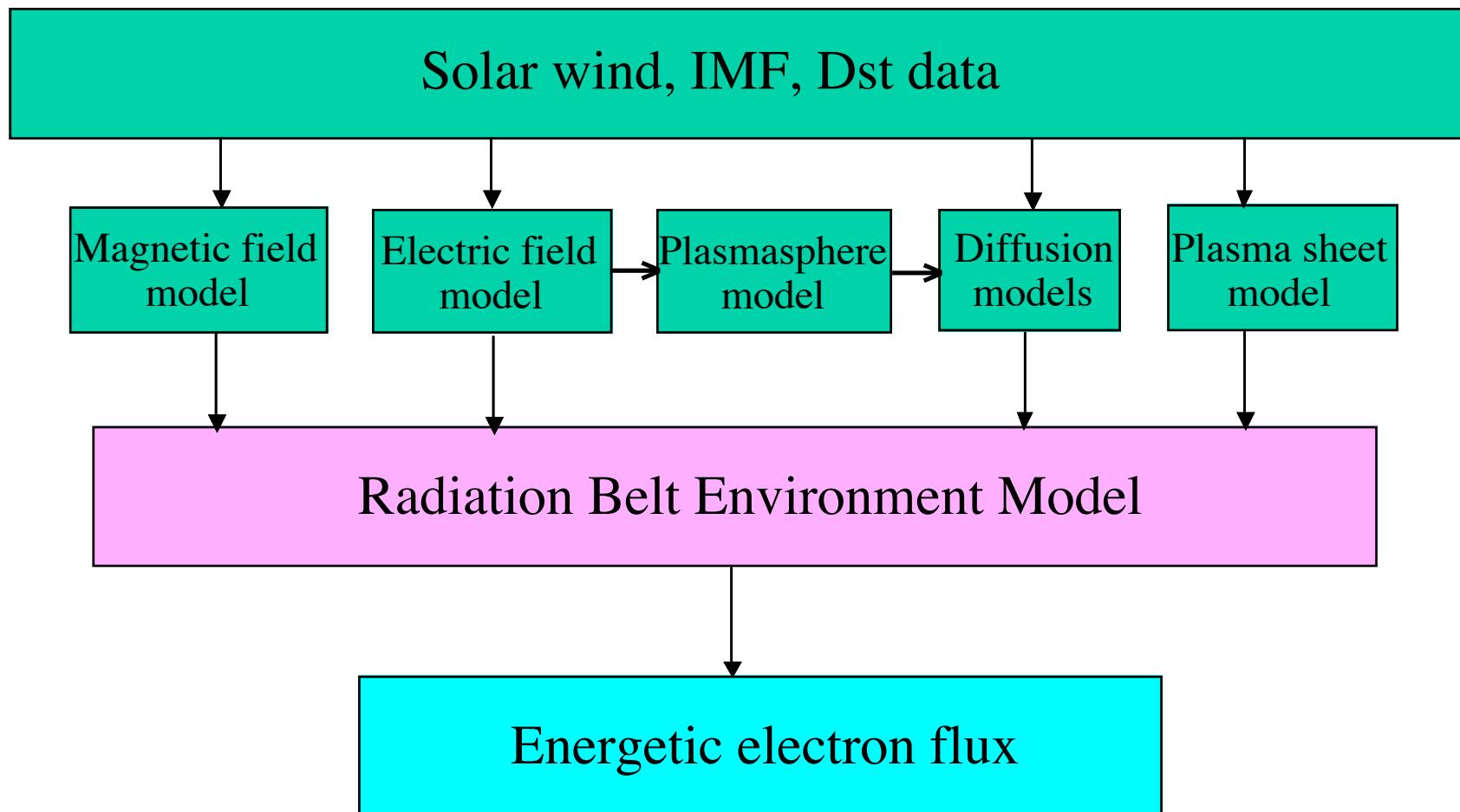
Filling of Slot Region During Major Storms (Strong Ring Current)



SAMPEX 2–6 MeV Electrons

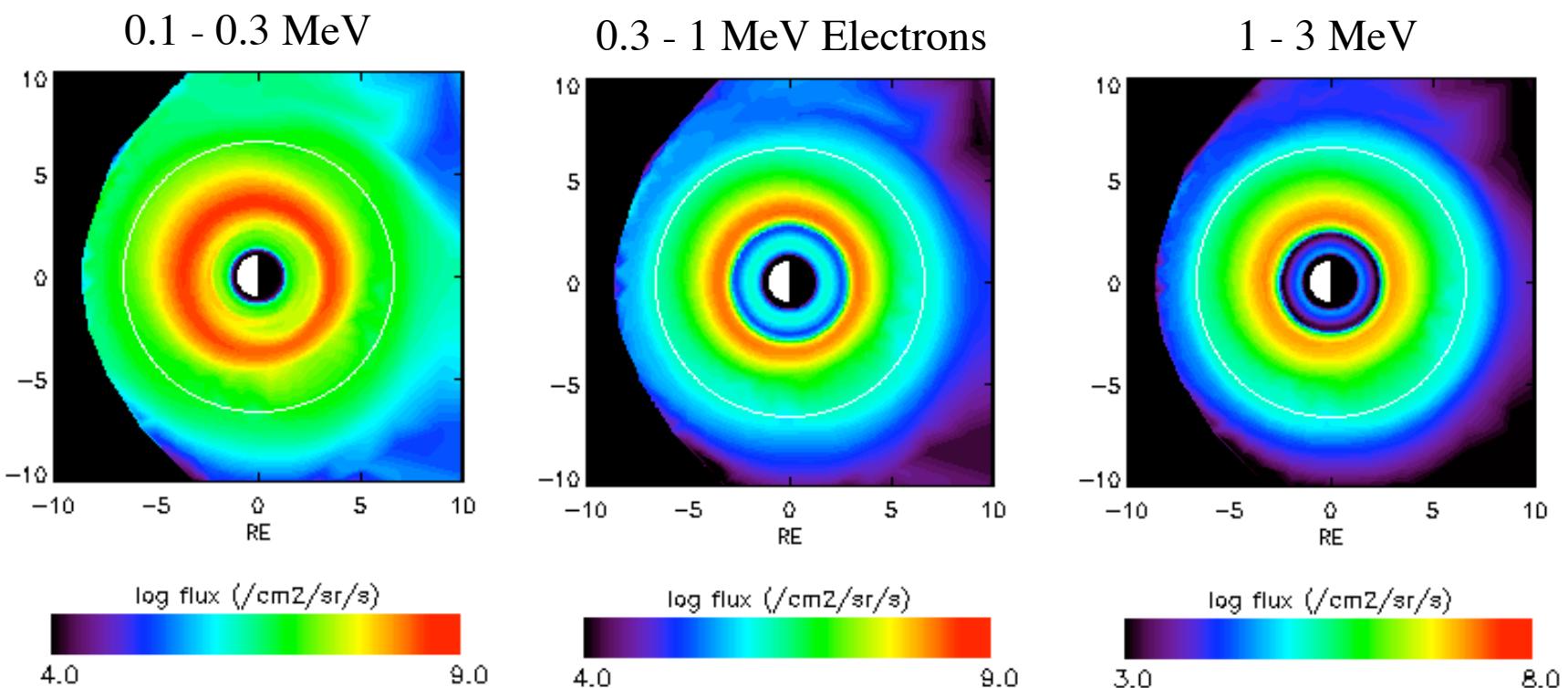
Courtesy of Yihua Zheng

The Radiation Belt Environment (RBE) Model



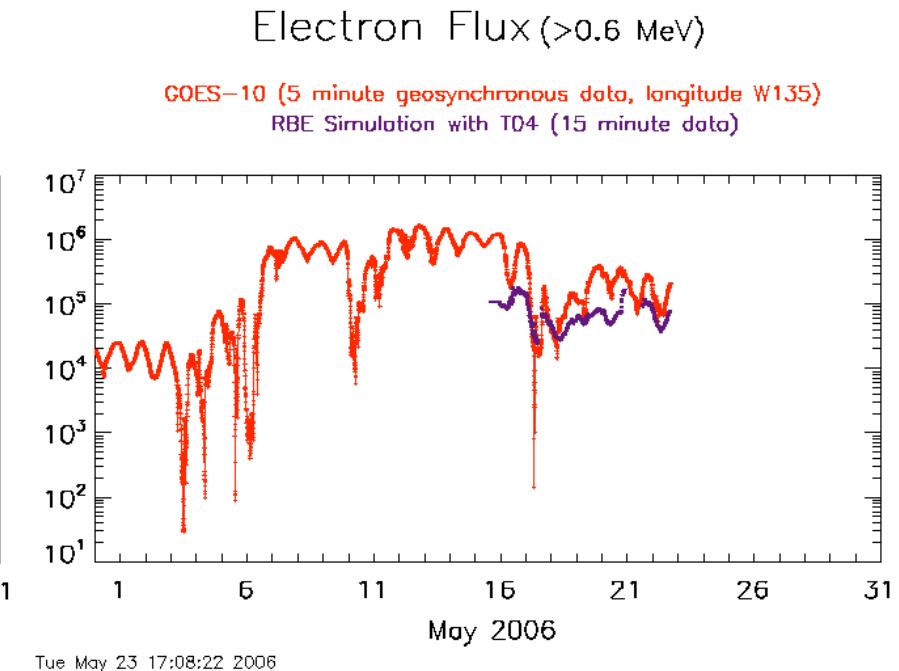
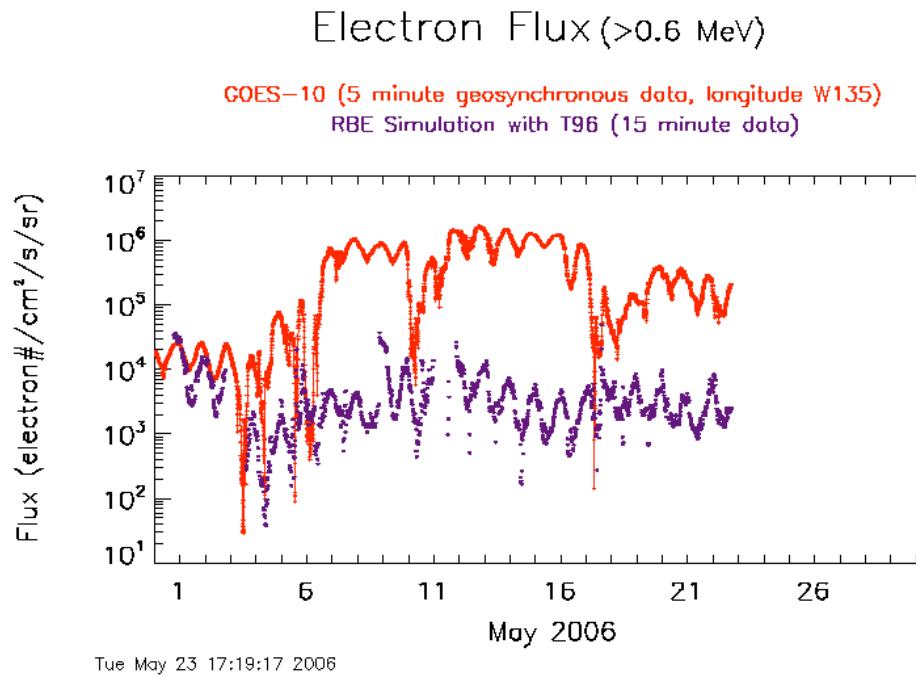
The Radiation Belt Environment (RBE) Model

$$\frac{\partial f_s}{\partial t} + \left\langle \dot{\lambda}_i \right\rangle \frac{\partial f_s}{\partial \lambda_i} + \left\langle \dot{\phi}_i \right\rangle \frac{\partial f_s}{\partial \phi_i} = \frac{1}{\sqrt{M}} \frac{\partial}{\partial M} \left(\sqrt{M} D_{MM} \frac{\partial f_s}{\partial M} \right) + \frac{1}{T(y) \sin 2\alpha_o} \frac{\partial}{\partial \alpha_o} \left(T(y) \sin 2\alpha_o D_{\alpha_o \alpha_o} \frac{\partial f_s}{\partial \alpha_o} \right) - \left(\frac{f_s}{0.5 \tau_b} \right)_{\text{loss cone}}$$

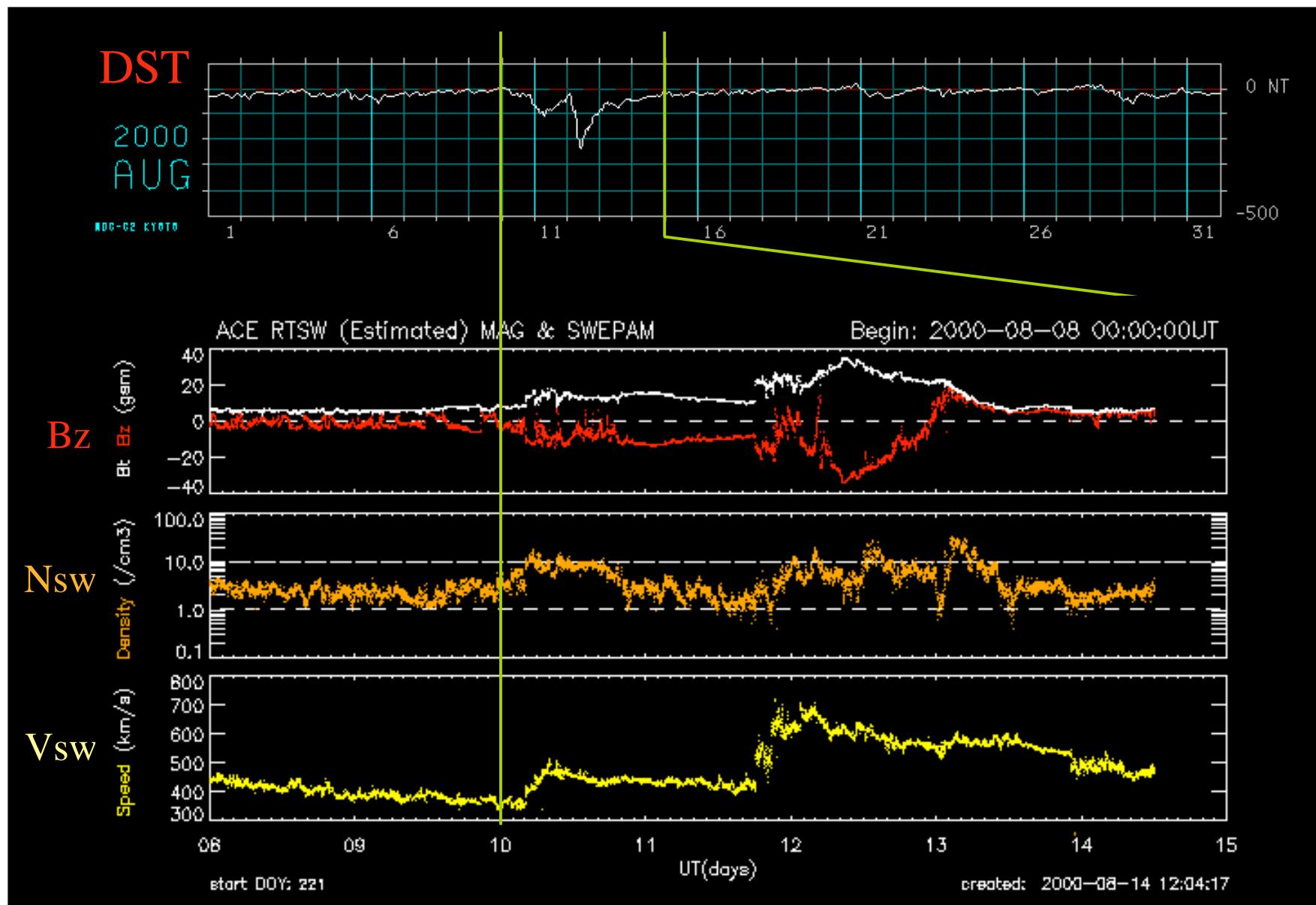


Real-Time Running of the RBE Model

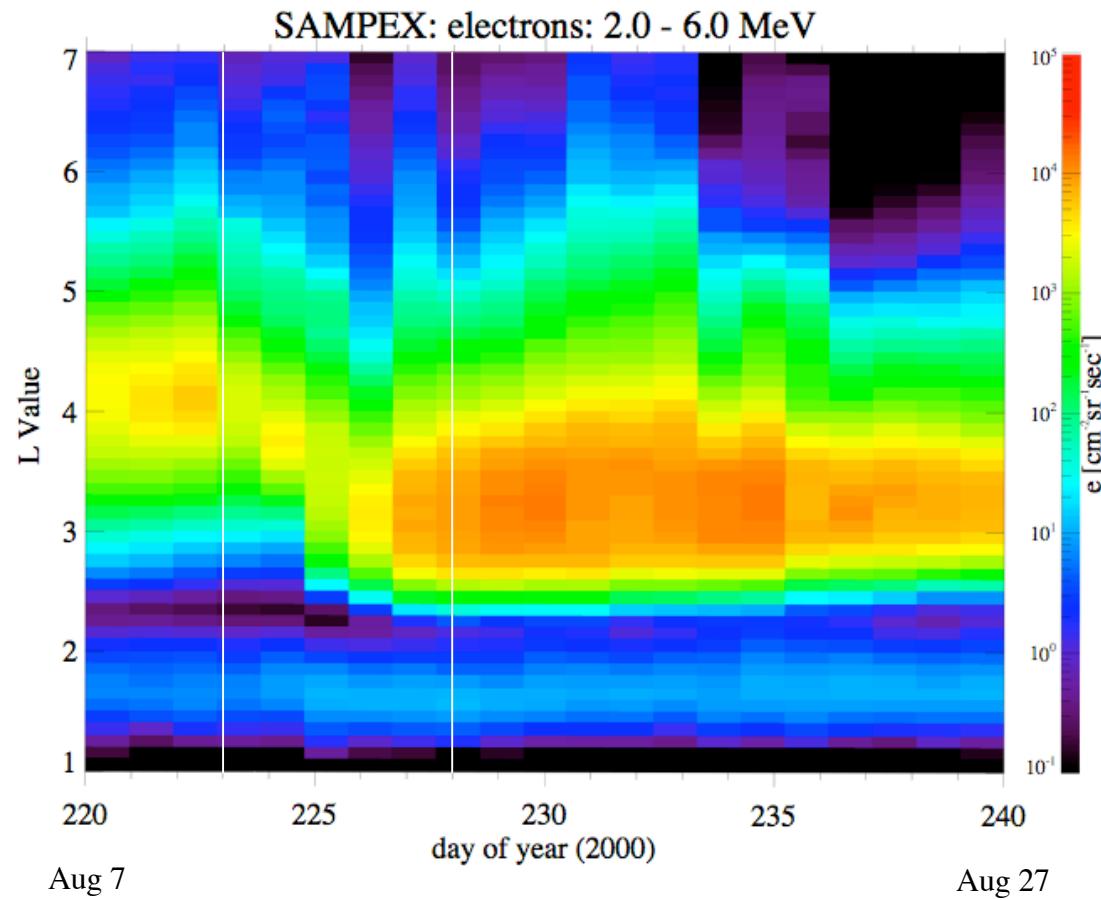
http://mcf.gsfc.nasa.gov/RB_nowcast/



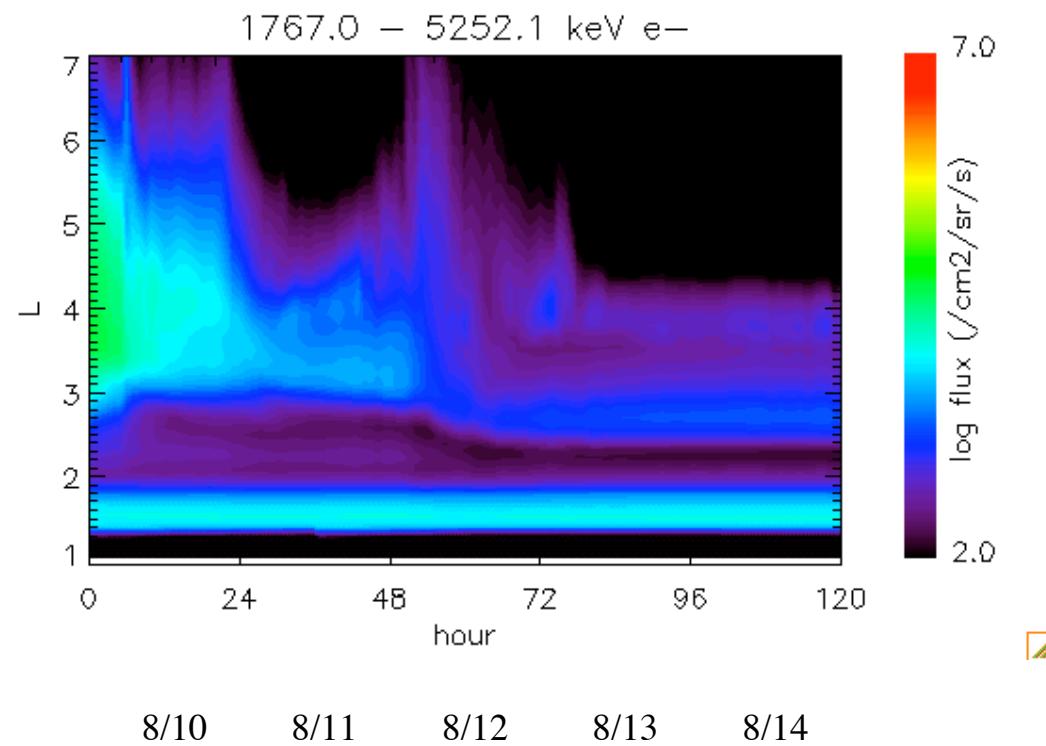
The Great Magnetic Storm on 10-14 August 2000



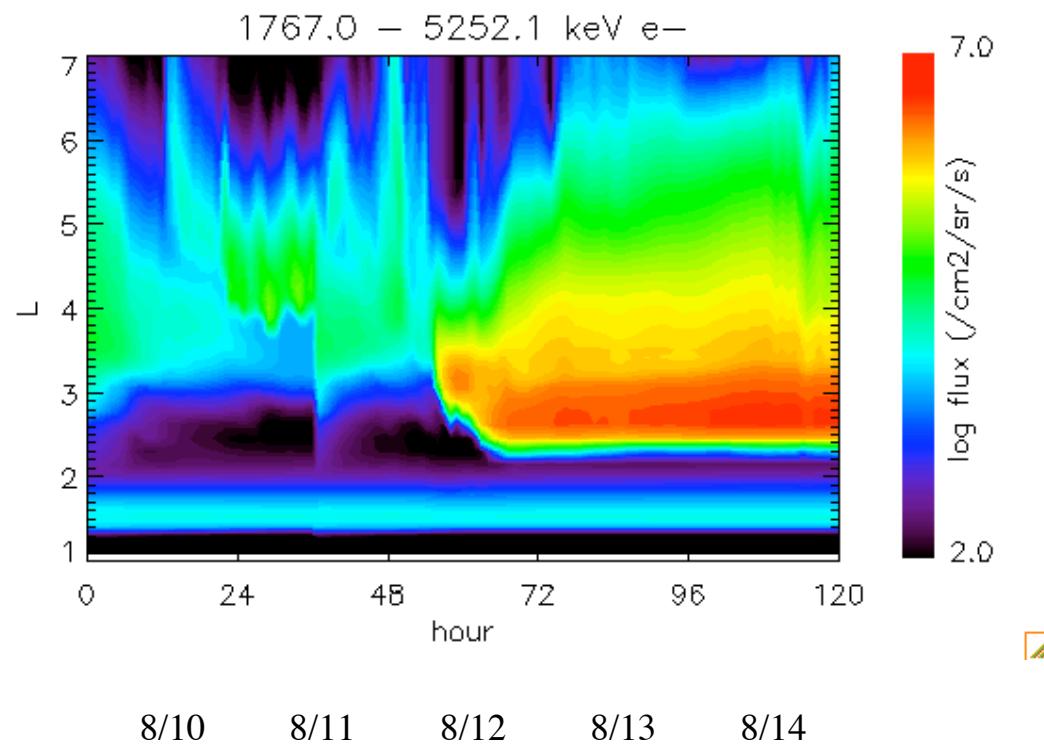
Filling of the Slot Region During the August 2000 Storm



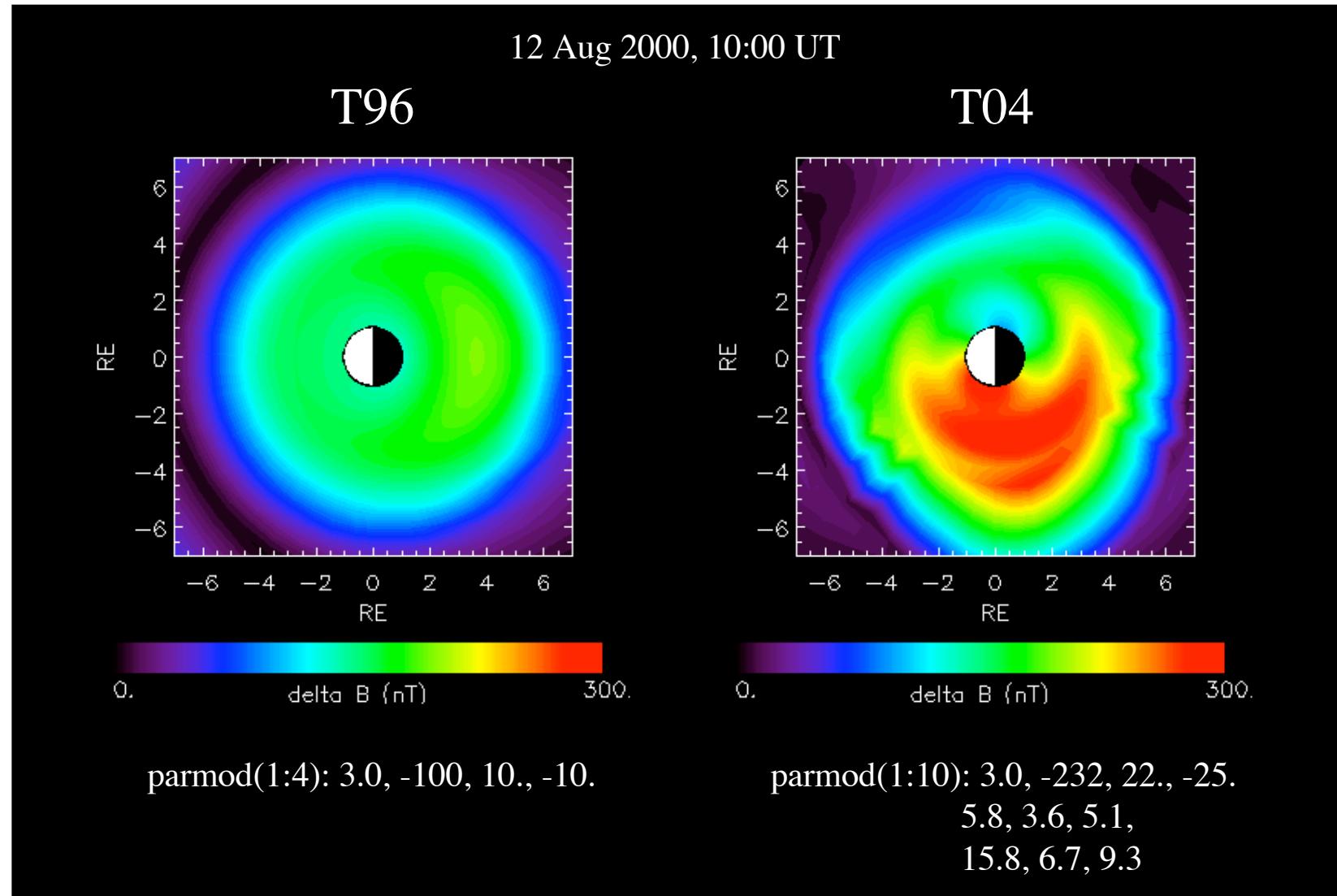
RBE Simulation with Tsyganenko 96 Magnetic Field Model



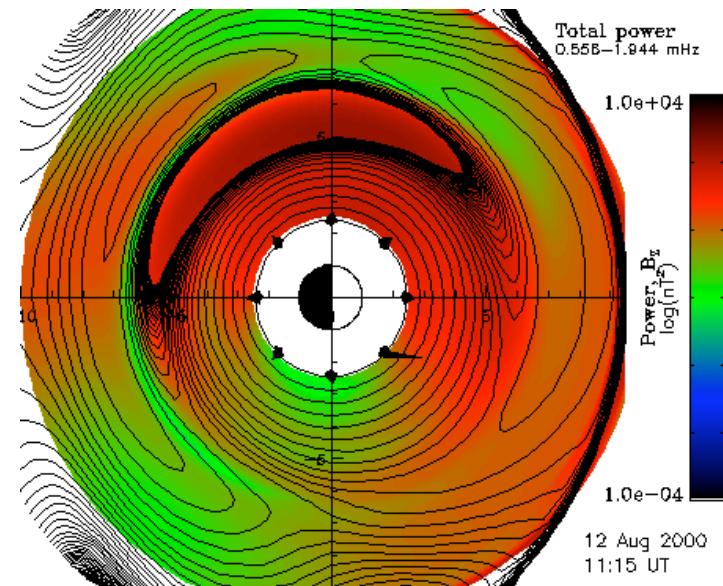
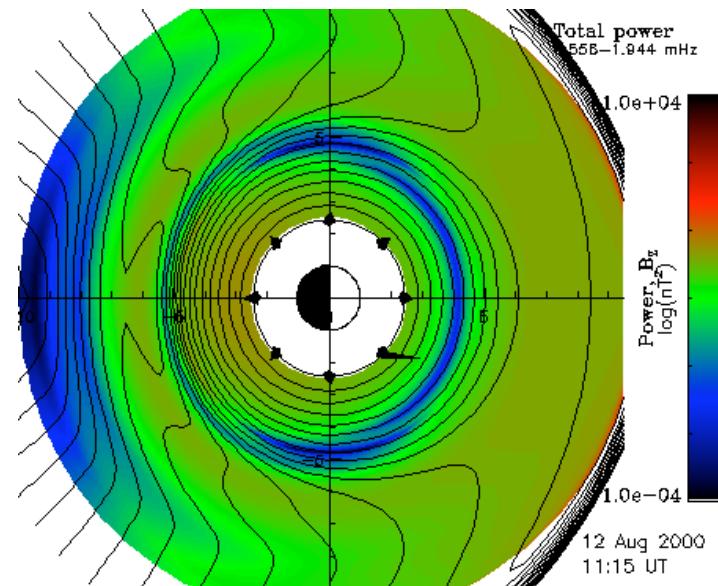
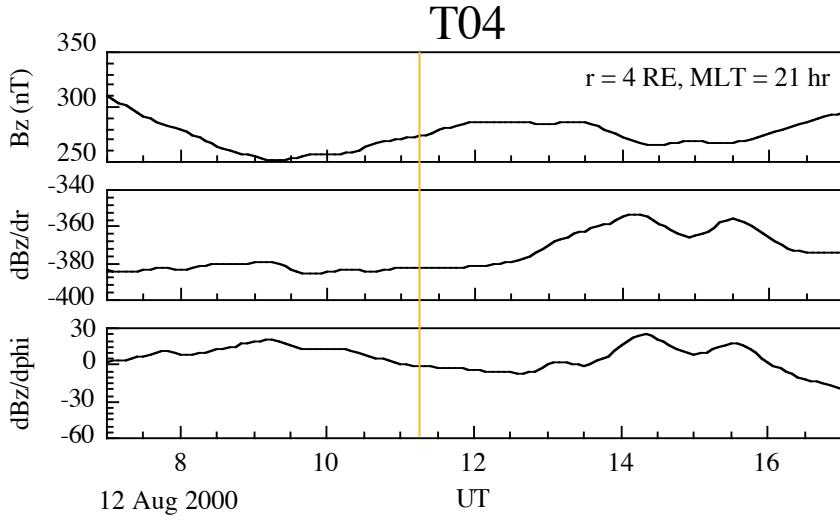
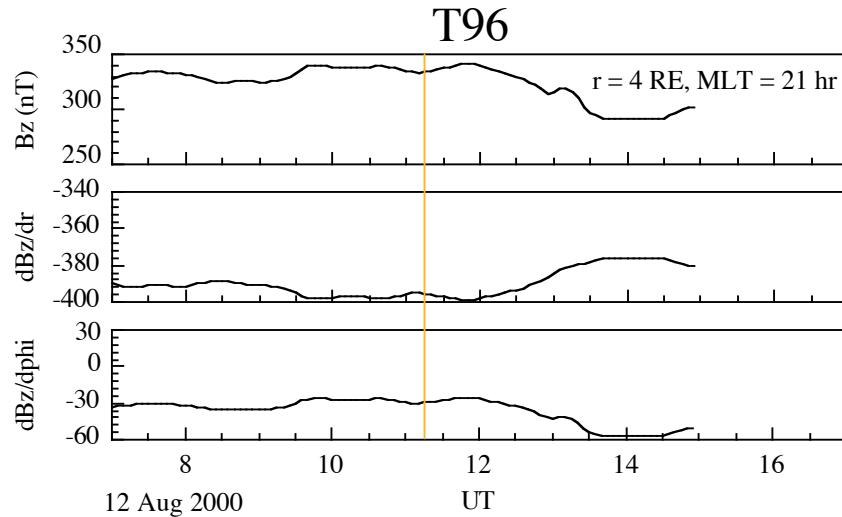
RBE Simulation with Tsyganenko 04 Magnetic Field Model



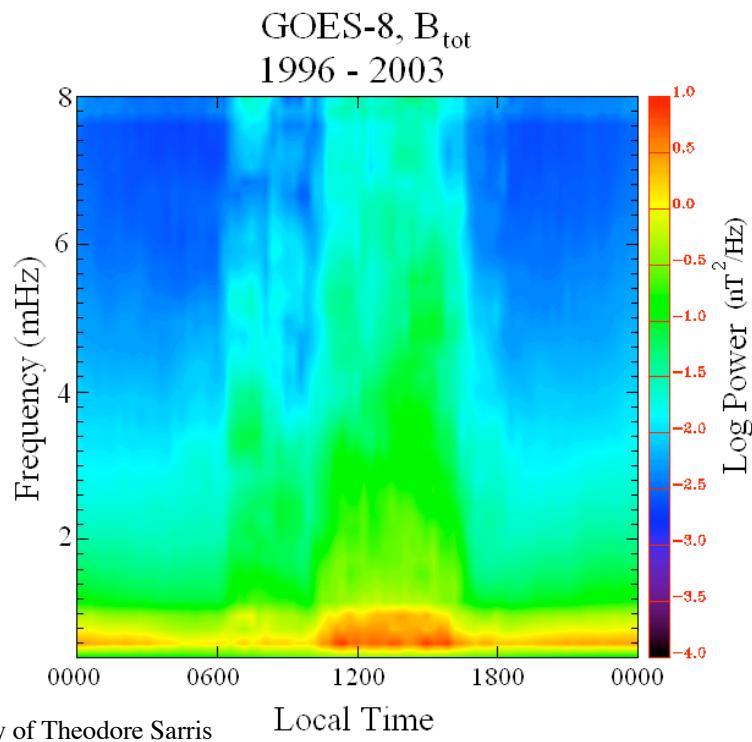
Magnetic Field Distortion in T96 and T04



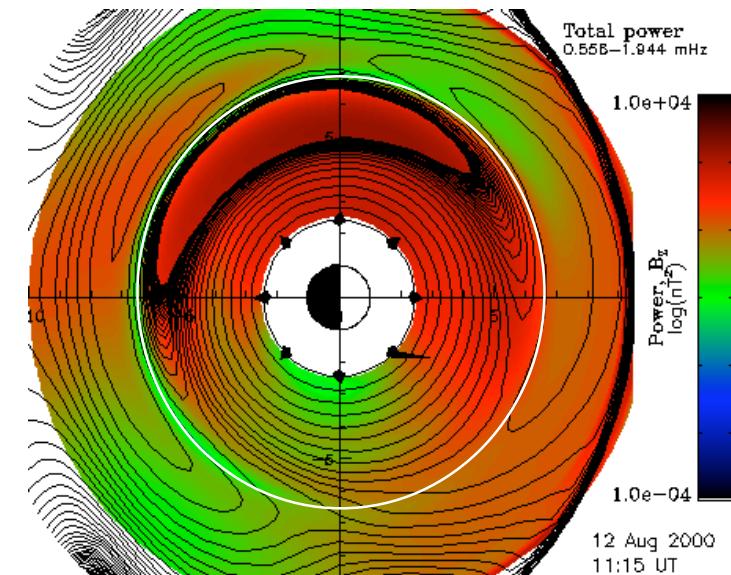
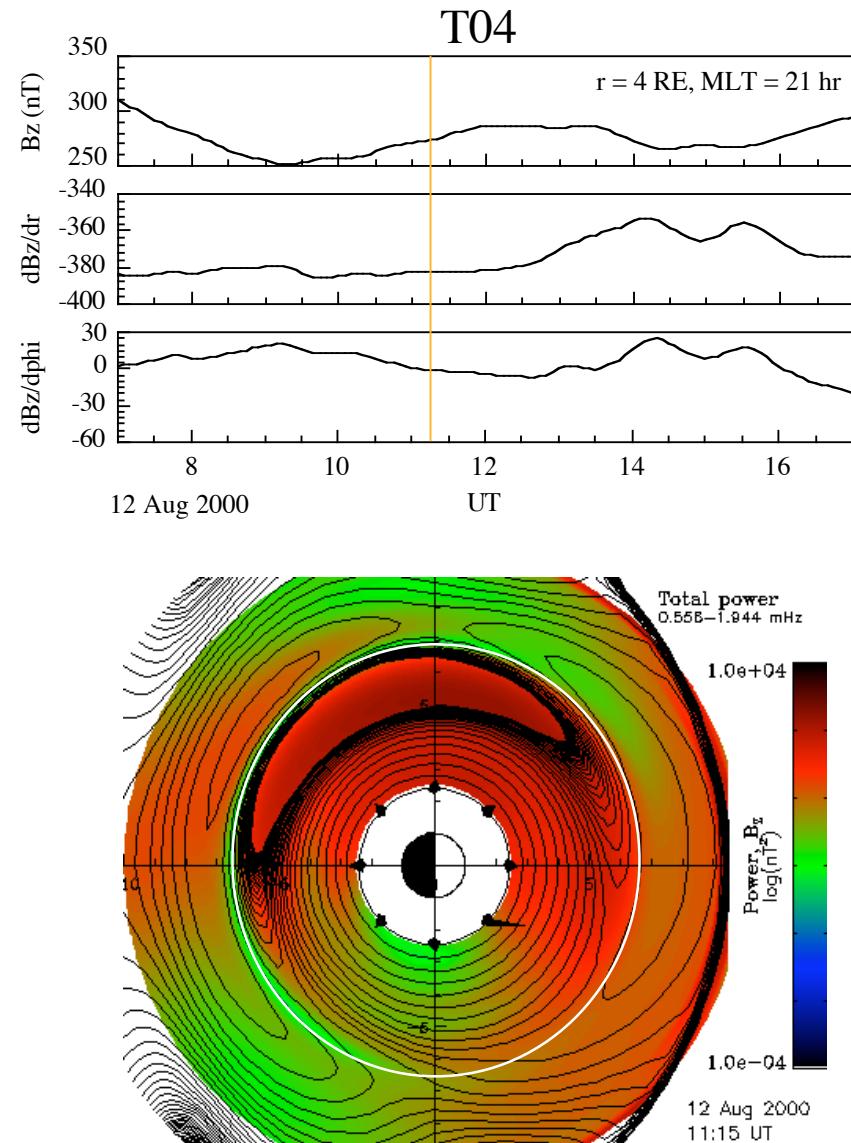
Spectral Analysis of the Time-Varying Tsyganenko Fields



Spectral Analysis of the Time-Varying Tsyganenko Fields



Courtesy of Theodore Sarris



Summary

- SAMPEX observation: filling of the slot region closely correlates with Dst (ring current)
- RBE simulation: storm on 10–14 August 2000
- RBE simulation reproduces filling of the slot region
- Ring current → magnetic distortions and fluctuations → radial transport of radiation belt particles → filling of the slot region

Backup Slides

RBE Simulation versus SAMPEX Observation

